

from Varian (Varian, Palo Alto, USA) integrates, for cranial lesions, the common Cone Beam Computed Tomography (CBCT) and kV-MV portal images to the Optical Surface Monitoring System (OSMS), a device able to detect real-time patient's face movements in all 6 couch axes (vertical, longitudinal, lateral, rotation, pitch and roll). We have evaluated the OSMS imaging capability in checking the patient's position and monitoring its motion.

Materials and Methods: An home-made cranial phantom was developed to evaluate the OSMS accuracy in four different experiments: (i) comparison with CBCT in isocenter location; (ii) capability to recognize predefined shifts up to 2-3°/cm; (iii) evaluation at different couch angles; (iv) ability to properly reconstruct the surface when one camera is covered by the EDGE.

Results: The OSMS system showed to be accurate for patient positioning respect to the CBCT imaging system with difference of 0.6 ± 0.3 mm for linear vector displacement, with a maximum rotational inaccuracy of 0.3° . OSMS presented an accuracy of 0.3 mm for displacement up to 1 cm and 1° , and 0.5 mm for larger displacements. Different couch angles induced a mean vector uncertainty <0.4 mm. Coverage of one camera produced an uncertainty <0.5 mm.

Conclusions: In conclusion, OSMS could be considered suitable for SRS accuracy positioning and monitoring.

EP-1672

Feasibility, safety and efficiency of delivering prostate SABR using flattening filter free VMAT

A. Duffton¹, D. Dodds², L. Devlin³, S. Smith⁴, C. Lamb², N. MacLeod², A. Sadozye²

¹Beatson West of Scotland Cancer Centre, Radiotherapy, Glasgow, United Kingdom

²Beatson West of Scotland Cancer Center, Clinical Oncology, Glasgow, United Kingdom

³Beatson West of Scotland Cancer Center, Radiotherapy, Glasgow, United Kingdom

⁴Beatson West of Scotland Cancer Center, Clinical Physics and Bioengineering, Glasgow, United Kingdom

Purpose/Objective: The radiobiological characteristics of prostate cancer have been investigated and evidence suggests a low alpha/beta ratio. As a result, increased tumour cell kill should correlate with increased dose per fraction. Improved tumour control rates should be possible by delivering large doses/fraction without increasing normal tissue toxicity.

Although in-vivo studies have supported this, the radiation delivery techniques reported have tended to use Cyberknife or other less sophisticated linear accelerator techniques.

The objective of this study was to assess feasibility, safety and efficiency of delivering FFF volumetric arc therapy for prostate SABR using: fiducial markers for verification and MRI/CT fusion for delineation.

Materials and Methods: Ethically approved safety and feasibility study including first 17 patients with low-intermediate risk prostate cancer, PSA ≤ 20 ng/ml and a Gleason score ≤ 7 . MRI/CT image fusion was used for target delineation.

Patients planned using Varian Eclipse (v.10.0.42) 10X FFF (2 arcs) and treated using Varian Truebeam STX to a dose of 35Gy/5 fractions. Patients were treated on the planned delivery schedule of alternate days which resulted in an

overall treatment period of 11 days. Cone-beam CT images were acquired pre and post treatment. Patients were assessed for acute and late gastro-intestinal (GI) and genitourinary (GU) toxicity before each treatment and at 4, 10 and 18 weeks. Planning criteria was assessed ensuring it was a clinically feasible method of planning and beam on time was recorded to assess efficiency.

Results:

Feasibility: Clinically acceptable plans were achieved for 100% of reported patients. (Table 1)

Safety: No RTOG acute toxicity of grade ≥ 3 was recorded for any of the 17 patients.

Efficiency: Mean treatment time for a course of conventional radiotherapy 1814.48 seconds and for SABR 603.1 seconds. This demonstrates a significant reduction in BOT of 67% for study patients ($p < 0.001$). (Table 1)

	Min	max	mean	SD
Dose to 95% of PTV	95.1	99.2	96.4	1.2
% of vol PTV 107 %	0	0.8	0.2	0.3
max PTV point dose	105.3	114.5	108.7	2.5
Rectum V18Gy	16.9	35.6	27.4	6.0
Rectum V28Gy	2.8	14.7	8.4	2.9
Rectum V32Gy	0.9	8.5	3.9	1.8
Rectum V35Gy	0	0.1	0.0	0.0
Rectum V36Gy	0	0	0.0	0.0
Bladder V37Gy	0	0	0.0	0.0
BOT (seconds)	120.4	121.4	120.6	0.3

Table 1. Planning information (%) for first 17 patients

Conclusions: Following the assessment of the first 17 patients, the research team is satisfied that all outcomes from this study are being met. Planning data has been achieved for all patients allowing treatment using the study method to proceed. Treatment has been tolerated well by patients with acute toxicity being within acceptable limits. A significant reduction in BOT has also demonstrated the study technique to be efficient.

EP-1673

Position accuracy of HexaPOD couch in combination with Elekta XVI-CBCT weekly test

A. López Muñoz¹, A. Gibert Serrano¹, C. Gullón Flores¹, D. Navarro Giménez¹, T. Ramírez Muñoz¹, M. Colomer Truyols¹
¹Consorci Sanitari de Terrassa (CST), Radiophysics Unit - Department of Radiotherapy and Oncology, Terrassa, Spain

Purpose/Objective: An important step in radiotherapy treatment delivery is the accuracy of patient positioning. In order to ensure the accuracy, stability and reproducibility of the HexaPOD™ robotic table, we started doing, since its initial clinical use in March 2014, weekly setup verifications with a QUASAR™ Penta-Guide phantom in combination with Elekta XVI CBCT. The objective is to verify if the couch, after applying known shifts in all directions, is able to reposition the phantom at the isocentre with high precision and very low and small deviations. Quality assurance (QA) of the XVI system alone is performed apart.

Materials and Methods: The test is performed with a cubic phantom (Penta-Guide) with air-filled spheres and dedicated to CBCT quality assurance. The HexaPOD™ table is positioned in its zero location to allow maximum corrections in all directions. The Penta-Guide is located at the isocentre with the room lasers and we apply known displacements in all translational directions with the phantom off-centre cross hair (10 mm X, 14 mm Y and 12 mm Z). Positioning accuracy is tested by comparing a reference CBCT phantom image with the weekly CBCT by the grey scale auto match tools of Elekta XVI. The translational and rotational corrections determined by registration are then transferred to the iGuide system, the software that controls the HexaPOD™ table, to apply the requested shifts to reposition the phantom. Translational and rotational position errors are recorded and analyzed. **Results:** From 25 images (which correspond to 75 translational and 75 rotational displacement measurements), we have found that 97.3% of all translational errors in achieving the isocentre location are ≤ 1 mm (96% in longitudinal and vertical directions and 100% in lateral direction). The average translational error is 0.47 mm longitudinal (0.20 - 1.40 mm), 0.45 mm lateral (0.00 - 1.00 mm) and 0.34 mm vertical (0.00 - 1.10 mm). 92% of all rotational errors are $\leq 0.3^\circ$ (88% roll, 92% pitch and 96% yaw). The average rotational error is 0.15° roll (0.00° - 0.40°), 0.17° pitch (0.00° - 0.40°) and 0.13° yaw (0.00° - 0.50°).

Conclusions: The HexaPOD™ table can correct setup errors in all planes with a very high precision level. A QA procedure is necessary to detect errors in a system with a sub-millimetre and a sub-degree accuracy aim. This QA test assures that mean setup error do not exceed 0.5 mm in translational directions and is below 0.2° in rotational movements. If we find errors exceeding our action levels (2 mm in translational and 1° rotational), further investigations have to be done. Because its simplicity and the benefits that can report to patient setup, we are considering to implement this test in our clinical daily basis.

EP-1674

Helical Tomotherapy (HT): role of Image-guided (IGRT) in treatment of nasopharynx focusing on acute toxicity

M. Gueci¹, A. Grillo¹, G. Caminiti¹, G. Evangelista², M. Bono², F. Sciumè²

¹Scuola di Specializzazione Radioterapia Oncologica Palermo, University of Palermo, Palermo, Italy

²ARNAS "Civico-Palermo Italy, Department of Radiation Therapy, Palermo, Italy

Purpose/Objective: to evaluate the efficacy of the Image Guided Radiotherapy (IGRT) with daily Megavoltage CT (MVCT) and acute toxicity in patients with nasopharynx cancer treated with HT.

Materials and Methods: From January 2013 to May 2014, 13 patients (pts), 9 females and 4 males, median age 64 years, with nasopharynx cancer (T2-T4a N2-N3), were treated and evaluate for acute toxicity, analyzing loss of weight, xerostomia, dysphagia, mucositis and dermatitis. Among them, 9 pts underwent platinum-based chemotherapy and concomitant radiotherapy and 4 pts exclusive radiotherapy, 3 due to poor general condition and 1 for the elderly. Three different planning target volume (PTVs) were defined: PTV1

included nasopharynx (local disease and margin) to a total dose (DT) of 69.96 Gy in 33 fractions (frs) with a daily fr of 2.12 Gy; PTV2 included lymph nodes high risk and we administered a DT of 59.4Gy in 33 frs at a daily fr of 1.8 Gy. PTV3 included lymph nodes low risk treated with a DT of 54.12 Gy in 33 frs at a daily fr of 1.64 Gy. Acute toxicity was evaluated using a questionnaire NCI- CTCAE 4.0 modified by a subjective scale of values from 1 to 10 (1 at the worst result and 10 at the best) investigating different types of toxicity in particular: xerostomia, dysphagia for liquids and solids (L/S), dysgeusia. We evaluate also weight loss and, according to the RTOG toxicity scales, skin toxicity and mucositis. Daily MVCT was performed in each patient.

Results: The median weight loss in the mid-treatment (mt) was 1,7 Kg, to the end of radiotherapy (ft) of 2.8 kg, to the first follow-up (1FU) of 3.2 kg, to the second FU (2FU) of 1.2 kg. The evaluation of xerostomia has detected a score of 6.2 to the mt and 5.3 to the ft, of 6.4 to the 1FU and 5.8 to the 2FU. Dysphagia (L/S) was evaluated to the mt of 5/5, 4.7/3.7 to the ft, 6.5/6.2 to the 1FU while 8/7.7 to the 2FU. Dysgeusia was 6.1 to the mt, 4.5 to the ft, 4.7 to the 1FU and 6,1 to the 2FU. Mucositis was mild to severe G1-G3, 1 case has evolved into G4. Skin toxicity G1-G2. 3 patients were re-simulate: two for loss of weight between second and the fifth week and the other patient at the first week for weight increased for concomitant use of steroids. In these cases, the MVCT occurred geographic miss with a hotspot on the bone marrow. IGRT allowed to record mismatching in 3 pts due to loss or increase of weight and re-simulate them. Dose constraints to organs at risk were easily respect in almost every patient due to high dose conformity allowed by HT, but correct contouring remains still critical. 22-24 Gy average planning dose was reported for parotid glands.

Conclusions: Our experience suggest us the use of daily MVCT is very important in the Head & Neck cancer, to identify early both any changes in anatomy of patient due to an important weight loss, and an undersizing of the lesion in response to therapy, for a treatment as conformed and adapted to the structure of the single patient. The acute toxicity is acceptable.

Electronic Poster: RTT track: Patient care

EP-1675

The impact of patient satisfaction and experience when the staffing model of a Radiotherapy department is changed

M. Cokelek¹, L. Chicas¹

¹Radiation Oncology Victoria, Epping, Melbourne Victoria, Australia

Purpose/Objective: In November 2013, Radiation Oncology Victoria (ROV) underwent a change in its radiation therapist staffing model to become a smarter and more efficient service provider. This project was developed to assess and test the hypothesis that patient satisfaction and experience can be maintained at high levels after a change in staffing model, testing the belief that staffing numbers impact on quality of service as measured by satisfaction. By analysing survey data using a Net Promoter Score (NPS) methodology,